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# REVIEW ON POLYHERBS USED IN WOUND HEALING

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**ABSTRACT:**

Herbs have played a significant role in both traditional and non-traditional medicine for over 5,000 years. The ongoing popularity of herbal remedies can largely be attributed to the belief that they produce minimal unwanted side effects. In recent years, scientists have increasingly relied on modern scientific methods and evidence-based approaches to validate the effectiveness of herbal medicines, gaining a deeper understanding of their mechanisms of action. However, quantitative data on the human health benefits of herbal medicines remain sparse or scattered, hindering their proper evaluation. Traditional medicinal plants are frequently utilized in the treatment of various skin-related ailments, particularly for wound healing. Herbal medicines used in wound management encompass a range of activities, including disinfection, debridement, and creating a conducive environment for natural healing. This review examines 5 plants commonly employed as wound-healing agents in traditional medicine across the globe.This literature review aims to evaluate the role of herbal medicines in wound healing, focusing on the commonly used medicinal plants, their quality, safety, and effectiveness, while also addressing concerns surrounding herbal medical products.

**Key words:** Herbs, wound healing, medicinal plant, extract.

## Introduction:

**Wound**: [1, 2]

A wound occurs when a living tissue's cellular, anatomical, and functional continuity are disrupted. It can result from an immune system response to the tissue or from a physical, chemical, thermal, microbiological, or other reaction. In contrast to burn wounds, which are brought on by fire, heat, radiation, chemicals, electricity, or sunlight, rips, cuts, and punctures in the skin are referred to as open wounds, and contusions caused by blunt force trauma are referred to as closed wounds.

**CLASSIFICATION OF WOUNDS:**[4]

According to the underlying reason of the wound's genesis, wounds are classed as open or closed, and according to the physiology of wound healing, they are classified as acute or chronic.

**Open wounds:** Blood leaves the body through an open wound, and the bleeding is readily apparent. Depending on what caused the wound, there are several sorts of open wounds that can be further classified.

- Incised wounds: It is a little injury with little to no tissue damage. It is brought on by a sharp object, like a knife or scalpel. In certain situations, bleeding can be severe, therefore prompt medical attention is necessary.
- Laceration wounds or tear wounds: This nonsurgical injury causes tissue loss and damage when combined with some sort of trauma.
- Abrasions or superficial wounds: A sliding fall onto a rough surface results in abrasion. Anguish results from abrasions because they remove the epidermis, the topmost layer of skin, exposing nerve endings. Serious abrasions can cause blood loss comparable to that of a burn.
- Puncture wounds: They are brought on by an instrument, like a nail or needle, puncturing the skin. Due to the possibility of dirt getting into the depth of the wound, there is a high risk of infection.
- Penetration wounds: The cause of penetration wounds is an object entering and exiting the skin, such a knife.
- Gunshot wounds: They result from a projectile, such as a bullet, entering or passing through the body.

**Closed wounds:** Blood in closed wounds leaves the body but escapes the circulatory system. Bruises are one way to see this. Forces lost in closed wounds are merely dangerous open wounds.

- Contusions or bruises**:** Blunt force trauma that damages tissue beneath the surface is what causes bruises.
- Hematomas or blood tumor: They are brought on by a blood vessel getting damaged, which leads to blood clotting beneath the skin.
- Crush injury: When a significant or extreme amount of force is applied to the skin over an extended length of time, crush damage results.

**Acute wounds:** An acute wound is a type of tissue damage that "usually leads to the sustained restoration of anatomic and functional integrity through an orderly and timely reparative process." Cuts or surgical incisions are typically the source of acute wounds, which heal within the anticipated time range.

**Chronic wounds:** Chronic wounds are those that have not healed through the regular phases and have instead entered a pathologic inflammatory state.

Chronic wounds either don't heal at all, take a long time to heal, or return regularly. Physical disabilities are primarily caused by these wounds.

***Wound healing:***

The intricate interplay of cellular and biochemical processes that results in the recovery of wounded tissues' strength and structural and functional integrity is known as wound healing. Inflammation, wound contraction, reepithelialization, tissue remodelling, and the creation of granulation tissue with angiogenesis are just a few of the overlapping stages and processes that are made possible by the process's ongoing interactions between cells and the matrix. If the phases of wound healing do not proceed in a predictable and timely manner, the healing process may proceed incorrectly and result in either a pathological scar, like a keloid scar, or a chronic wound, like a venous ulcer.[3]

The process of wound healing is intricate and highly regulated, including a series of cellular activities and the activity of mediators. Normally, this sequence of events overlaps and culminates in the repair of the injured tissue.[5] Normal wound healing is impacted and impeded by a number of factors, including age, obesity, smoking, complex comorbidities, medication, infections, and nutrition.[6,7] The healthcare system is heavily burdened socially and financially by morbidity linked to delayed wound healing.[8]The global population is growing quickly, with older adults making up the fastest-growing age group globally. Between 2000 and 2050, the percentage of people over 60 is predicted to double, from 11% to 22%.[9] An estimated 11.8 million people in the UK are over 65, accounting for 18% of the country's total population.[10] In Eng en, one in five individuals will be over 65 by 2030. An estimated 2.2 million patients with wounds were managed by the NHS in 2012–2013, and the yearly cost was anticipated to be between £4.5 and £5.1 billion[11]

***Anatomy of the skin:***

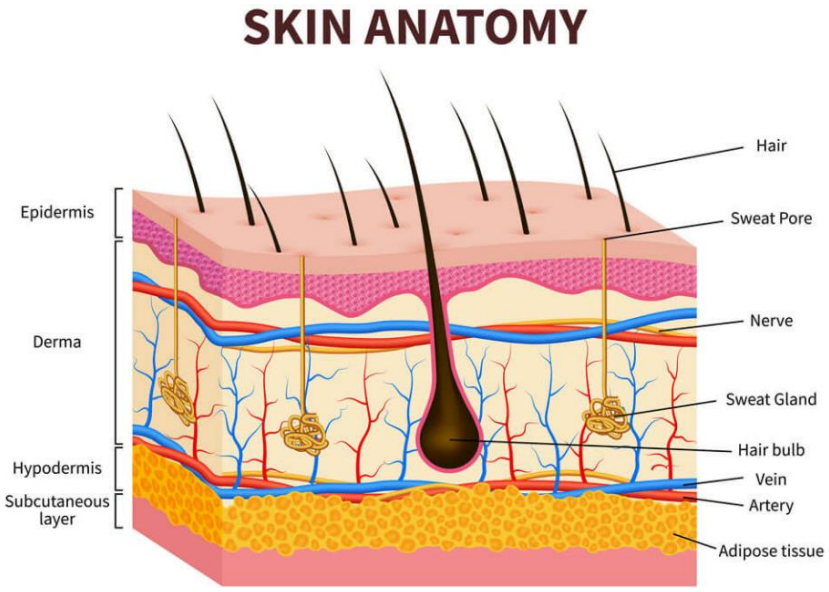


**fig.1.anatomy of skin**

The epidermis and dermis are the two tissue compartments that make up the skin, which is the biggest organ in the body. The epidermis, the skin's topmost layer, is a stratified layer made up of epithelial cells that acts as a barrier to keep out hazardous environmental elements and invasive microorganisms[12]. The thickness of the epidermis varies according to the anatomical site and is constantly interacting with the environment.[13]The dermal-epidermal junction (DEJ) connects the skin's epidermal layer to the dermis underneath[14] In terms of structure, the dermis is made up of extracellular matrix (ECM), which is composed of glycos aminoglycans (GAGs), collagen, and elastin. [15] (fig.1).The structure of human skin changes significantly in several ways as it ages[16].The skin's structural integrity and physiological function are lost due to a confluence of internal and external forces[17] Long-term exposure to UV radiation from sunshine or environmental harm are examples of the former [18] Conversely, the latter include modifications to proteins, growth factors, and cellular activity that cause alterations to the epidermis and dermis.[15]An increasing number of age-related ailments, such as pressure ulcers and persistent sores, are linked to aging skin.[18,19].

## Commonly Used Medicinal Plants as Wound Healers:

For primary healthcare, people in both developed and poor nations rely on herbal remedies. Traditional medicine's use is influenced by a number of factors, including accessibility, cost, and people's strong belief systems[20]. This section features a select few commonly accessible plants with notable therapeutic properties, such as the ability to cure wounds.

**Eucalyptus**(Nilgiri Tree):

**fig.2.,Nilgiri tree**

Biological source: It is obtained from fresh leaves of *Eucalyptus globules.*
Family: *Myrtaceae*
Chemical constituent: Eucalyptol, cineole, Sesquiterpene, ferric acid, Eucalyptin, Rutin.

In Southern India as well as certain regions of Northern and Western India, eucalyptus is abundantly planted. It is a tall, evergreen tree that thrives in rich, deep soil that is well-drained and has enough moisture. It rises to a height of over 300 feet. The tree inverted, sessile, cordate-praise leaves are attached to a slightly blue-white flower on adolescent stems[21.]Dinkum Oil is the oil that is extracted from Eucalyptus globules by steam distilling fresh leaves. It is used in skin care to treat cuts, blisters, bug bites, burns, herpes, and wounds. Additionally, it strengthens the immune system and aids in the treatment of measles, the common cold, chicken pox, and the flu. An oil derived from eucalyptus is used as an expectorant and antimicrobial to reduce inflammation[22,23].Both topical and oral application of Eucalyptus citriodorais extracts prove to be highly efficacious in the treatment of cutaneous wounds. These extracts quicken every stage of wound healing. [24].
Angiogenesis, collagen deposition, granulation tissue development, epithelization, and wound contraction during the proliferative stage have all been suggested as ways in which these concentrations work. The extract's phytoconstituents, which include tannins, flavonoids, and phenolic chemicals, are thought to work in concert to produce these effects. The combined effects of phytochemicals like tannins, flavonoids, and phenolic mixtures in the concentrates are responsible for this actions.[24].
Compounds including 1, 8-cineole, citronellal, citronellol, citronellyl acetate, p-cymene, eucamalol, limonene, linalool, β-pinene, γ-terpinene, α-terpinol, alloocimene, and aromadendrene are primarily responsible for the antibacterial action of eucalyptus extracts. [25, 26.]

**Eryngium:**

**fig.3.eryngium**

Biological source: It is obtained from the flower of *Eryngium.*
Family: *Apiaceae*
Chemical constituent: limonene, beta-sesquii, alpha-pinene, delta-2-carn, monoterpenoids.

It is a plant that is indigenous to America, Central Asia, and Central and Southeast Europe. This plant is a member of the family Apiaceae. The pharmacological properties of eryngium are mostly attributed to its constituent flavonoids, phenolic acids, and coumarins.Considering[27-]When this component is present, eryngium has strong antioxidant and antibacterial properties. Previous research has demonstrated that the flavonoids in the plant extract are responsible for eryngium's strong antioxidant action.[32]Thus, it has been demonstrated that eryngium possesses some pharmacological properties, including antibacterial, antioxidant, antidiuretic, antitussive, aphrodisiac, appetizer, and stimulant properties.[33,34,35]This plant has been shown by certain researchers to exhibit antibacterial, anti-yeast, antiviral, and antifungal action. The plant's polyacetylenes have also been shown to exhibit antifungal and antibacterial properties. High antibacterial activity against S. aureus, Listeria monocyatogenes, Bacillus, E. coli, Salmonella typhimurium, P. acnes, S. bovis, S. pyogenes, S. dysgalactiae, S. pneumonia, and Pseudomonas is demonstrated by the plant's extracts and essential oil[36,37.]

**Country fig (Ficus racemosa):**

**fig.4.,country fig**

Biological source: It is obtained from *Ficus racemosa* plant.
Family: *Moraceae*
Chemical constituent: anthocyanins, polyphenols, biopolymers, fatty acids

The ability of an aqueous and ethanolic extract of Ficus racemosa (F. racemosa) roots to cure wounds in Wistar albino rats [38], Ketamine anesthetics should be used to make the wound initially. Thus, measurements were made of the scar area after full epithelization, the percentage of wound closure, and the epithelization duration. The plant F. racemosa's root ethanolic extract significantly increased the percentage closure through improved epithelialization. The effect of F. racemosa extracts on increased collagen synthesis could be the cause of this enhanced epithelialization. Greater breaking strength denotes improved wound healing. [39] from the fourth day onward, a significant decrease in the wound area was observed in the Ficus racemosa Linn extract group as compared to the control group. The outcome shows that by reducing the wound's surface area, the aqueous extract of Ficus racemosa Linn speeds up the healing process. It was discovered that the extract's activity was extremely significant ($P < 0.001$). Numerous other bioactive substances, such as tiglic acid, higher hydrocarbons, and other phytosterols from fruit, taraxerone, etc., have also been isolated from F. recemosa. [41,42]

**Plantain tree (Musa paradisiaca):**

**fig.5.musa paradisiaca**

Biological source: It is obtained from *musa paradisiaca* plant.
Family: *Musaceae*
Chemical constituent: serotonin, nor-epinephrine, tryptophan, tannin.

In rat models, Musa paradisiaca extract significantly accelerates the healing of wounds. According to a multicentric experiment, plantain bananas can help postpone the recurrence of ulcers and aid in the early healing of ulcer dyspepsia.[43]It is well known that flavonoids improve vascularity and prevent or delay the start of cell necrosis, which both minimize lipid peroxidation. Inflammatory cells encourage endothelial cell migration and proliferation during the tissue repair process, which results in the neovascularization of connective tissue cells. These cells then produce extracellular matrices, such as collagen, and the injured tissue reepithelialises.[44]

**5.Bael (Stone apple):**

**fig.6.bael**

Biological source: It is obtained from plant of *Bael*.
Family: *Rutaceae*
Chemical constitute: carotenoids, phenolics, coumarins, flavonoids,terpenoids.

Bael is a medium-sized, aromatic, slender tree that grows wild across India's deciduous forests. Its height ranges from 6.0 to 7.5 meters and its girth from 90 to 120 centimeters. Bael leaves are topically administered to promote wound healing. [45]. For almost 5,000 years, the people who live in the Indian subcontinent have used Aegle marmelos leaves. It is a native plant. Its leaves, bark, roots, fruits, and seeds are widely used to cure a wide range of ailments in Ayurveda and other traditional remedies. Scientific reports indicate that fruits of Bael have a wide range of therapeutic effects, validating many of the ethnomedicinal uses. These effects include free radical scavenging, antioxidant, inhibition of lipid peroxidation, antibacterial, antiviral, anti-diarrheal, gastroprotective, antiulcerative colitis, hepatoprotective, anti-diabetic, cardioprotective, and radioprotective. [46,47]Aegle marmelos leaf extracts have strong antioxidant properties and function as an antigenotoxicant to help heal wounds. [48,49]49The active ingredients in Aegle marmelos root extract speed up wound healing and give the healed wound breaking strength[45]. Because Aegle marmelos fruit pulp promotes collagen determinants and reduces inflammation, it has effects on wound healing. [50]

## A brief list of herbal antimicrobial agents and its medicinal applications and main biological compounds:

**Table no.1**

| Herbal material | Medicinal application | Biological compounds | Ref. |
|---|---|---|---|
| Eucalyptus | Antioxidant, antimicrobial anti-inflammatory and antipyretic | Flavonols, hydroxybenzoic acids and hydrolyzable tannins | 51,52 |
| Eryngium | Antiviral, antibacterial, antioxidant, anti inflammatory ,cough, diabetes. | limonene,beta-sesquii,alpha-pinene,delta-2-carn,monoterpenoids | 19,20,21 |
| Country fig | Laxative, high cholesterol ,skin conditions, anticancer ,anti tubercular | anthocyanins, polyphenols, biopolymers, fatty acids | 24,25,26 |
| Plantain tree | Anti inflammatory ,respiratory treatment, anticancer, antioxidant | serotonin, nor-epinephrine, tryptophan ,tannin | 28,29 |
| Bael | Antidiarrheal,gastroprotective,antiulcer,anti-diabetic,cardioprotective | carotenoids, phenolics, coumarins , flavonoids, terpenoids. | 45,46,47 |

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